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## PACKAGED DIAPERS ASSEMBLY

## BACKGROUND OF THE INVENTION

This invention relates to a packaged assembly consisting  
5 of a plurality of disposable diapers orderly packed within a  
package so that these diapers may be placed one upon another  
between both side walls opposed to each other.

Japanese Patent Application Publication No. 2000-42028A  
discloses a packaged assembly consisting of a plurality of  
10 pants-type disposable diapers orderly packed within a package  
each comprising a liquid-pervious topsheet, a  
liquid-impervious backsheet and a liquid-absorbent core  
disposed between these two sheets. Within the package, these  
diapers are arranged so that front waist regions are opposed  
15 to rear waist regions for respective pairs of the adjacent  
diapers. Each of these diapers packed in this manner, a crotch  
region is folded toward the rear waist region of this diaper.  
Within the package, waist-surrounding peripheral end portions  
of the front and rear waist regions of the respective diapers  
20 occupy an upper packaging space of the package and the remaining  
portions of the respective diapers except for the  
waist-surrounding peripheral end portions occupy the lower  
packaging space defined below the upper packaging space.

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In most of the disposable diaper, the liquid-absorbent core does not extend to the waist-surrounding peripheral end portions of the front and rear waist regions and therefore the remaining portion of the diaper except for the

5 waist-surrounding peripheral end portions has a thickness larger than that of those waist-surrounding peripheral end portions. Particularly when the crotch regions of the respective diapers are folded toward the respective rear waist regions to pack the diapers in this manner of the prior art,

10 the thickness of the remaining portions except for the waist-surrounding peripheral end portions of the waist regions will be remarkably larger than the thickness of these waist-surrounding peripheral end portions. This will lead to a remarkably large difference of the thickness between the

15 portion of the diapers occupying the upper packaging space of the package and the remaining portions of the diapers occupying the lower packaging space of the package.

According to the packaged assembly as disclosed in the above-cited Publication, a total thickness of a group of diapers

20 placed one upon another between both side walls opposed to each other of the package is larger in the packaging lower space than in the upper packaging space of the package. In other words, even if the diapers are packed so as to occupy the maximum

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dimension between the both side walls opposed to each other of the package at its bottom, a gap will be left between each pair of the adjacent waist-surrounding peripheral end portions of the diapers in the upper packaging space of the package and efficiency for packing the diapers into the package will be  
5 deteriorated. Furthermore, this packaged assembly of the prior art is disadvantageous in that, when the groups of the diapers stacked vertically are packed in the package, the groups of the diapers occupying the upper packaging space of the  
10 package tend to flatten or collapse the waist-surrounding peripheral end portions of the diapers occupying the lower packaging space of the package and may form these waist-surrounding peripheral end portions of the diapers with a plurality of irregular wrinkles.

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## SUMMARY OF THE INVENTION

An principal object of this invention is to provide a packaged assembly consisting of a plurality of disposable diapers efficiently packed in a package without anxiety that  
20 the waist-surrounding peripheral end portions of the respective diapers might be formed with a plurality of irregular wrinkles.

According to this invention, there is provided a packaged diapers assembly comprising a package formed of a flexible sheet

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in a rectangular hexahedron having first and second side walls opposed to each other and a plurality of disposable diapers, each including a main body having an absorbent core attached thereto and respective waist-surrounding peripheral end portions of front and rear waist regions free from the absorbent core, packed within the package so that the disposable diapers are stacked one upon another in vertical direction of the package with the front and rear waist regions being opposed to each other in each of the diapers.

10       The package contains therein first diapers each having the waist-surrounding peripheral end portions of the respective waist regions facing to the first side wall of the package and second diapers each having the waist-surrounding peripheral end portions of the respective waist regions facing to the second  
15 side wall of the package and the plurality of diapers stacked in the vertical direction of the package constitute a group in which the number of the first diapers is equal to the number of the second diapers.

      According to one preferred embodiment of this invention,  
20 a difference between the number of the first diapers and the number of the second diapers is in a range of  $0 - \pm 3$ .

      According to another preferred embodiment of this invention, the groups of at least two are arranged between the

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first and second side walls within the package.

According to still another preferred embodiment of this invention, the groups of at least two are packed side by side within the package.

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#### BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a partially cutaway perspective view showing a package;

Fig. 2 is a side view showing the package as the diapers  
10 therein being exposed;

Fig. 3 is a partially cutaway perspective view showing the diaper as partially broken away;

Fig. 4 is a side view of a package illustrating one preferred embodiment of the packaged assembly comprising the  
15 diapers orderly packed within the package; and

Fig. 5 is a side view of a package illustrating another preferred embodiment of the packaged assembly comprising the diapers orderly packed within the package.

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#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Details of the method according to this invention for orderly packing a plurality of diapers within a package will be more fully understood from the description given hereunder

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in reference to the accompanying drawings.

Fig. 1 is a partially cutaway perspective view showing a package 1A, Fig. 2 is a side view showing the package 1A with a third side wall 6 cutaway to expose diapers 9 packed therein  
5 and Fig. 3 is a partially cutaway perspective view showing the individual diaper 9 taken out from the package 1A. In Figs. 1 and 2, a transverse direction as viewed between third and fourth side walls 6, 7 a forward direction as viewed between first and second side walls 4, 5 is indicated by an arrow Y1,  
10 a backward direction as viewed between the first and second side walls 4, 5 is indicated by an arrow Y2 and a vertical direction is indicated by an arrow Z. Term "inner surfaces" of a topsheet 10 and a backsheet 11 used herein should be understood to mean respective surfaces thereof facing a liquid-absorbent core 12  
15 (absorbent member) and term "outer surfaces" of these sheets 10, 11 should be understood to mean respective surfaces thereof facing away from the core 12.

This packaged assembly comprises the package 1A and the pants-type disposable diapers 9 orderly packed within the  
20 package 1A, wherein the diapers 9 are arranged within the package 1A for the maximum packing efficiency. In this packaged assembly, a plurality of the diapers 9 are packed within the package 1A so as to be stacked in the vertical direction under

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a compression.

The groups G each consisting of twelve diapers 9 stacked in the vertical direction are placed one upon another between the first and second side walls, as seen in Fig. 2. These two  
5 stacks of the groups G are placed side by side also within the package 1A, i.e., totally four groups G of the diapers 9 are packed within this package 1A.

The package 1A is formed of a flexible sheet in a rectangular hexahedron being relatively long in the vertical  
10 direction, in which each pair of adjacent surfaces are substantially orthogonal to each other. The package 1A comprises substantially rectangular top and bottom walls 2, 3 opposed to each other, substantially rectangular first and second side walls 4, 5 vertically extending between respective  
15 opposite ends of the top and bottom walls 2, 3, and substantially rectangular third and fourth side walls 6, 7 vertically extending between respective opposite side edges of the top and bottom walls 2, 3. The top wall 2 is provided with a handling projection 8 extending between first and second side walls 4,  
20 5 of the package 1A.

As will be seen in Fig. 3, the diaper 9 comprises a liquid-pervious topsheet 10 facing a wearer's body, a liquid-impervious backsheet 11 facing away from the wearer's

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body and a liquid-absorbent core 12 interposed between these two sheets 10, 11. The core 12 is bonded to the inner surface of at least one of the top- and backsheets 10, 11.

The core 12 comprises a mixture of fluff pulp and  
5 super-absorbent polymer particles or a mixture of fluff pulp, super-absorbent polymer particles and thermoplastic synthetic resin fibers, in any case, compressed to a desired thickness. Necessarily, thickness of the core 12 is larger than those of the top- and backsheets. Preferably, the core 12 is entirely  
10 covered with a liquid-pervious sheet such as tissue paper or hydrophilic fibrous nonwoven fabric in order to prevent it from getting out of shape and/or to prevent the polymer particles from falling off.

The diaper 9 has front and rear waist regions 13, 14  
15 opposed to each other. In the diaper 9, transversely opposite side portions 16 of the respective waist regions extending in the longitudinal direction are overlaid and joined to together in the vicinity of outermost edges of the respective side edge portions 16 by means of heat-sealing lines 20 arranged  
20 intermittently in the longitudinal direction. The diaper 9 is formed with a waist-hole 18 and a pair of leg-holes 19 lying below the waist-hole 18.

In the diaper 9, longitudinally opposite ends 12a of the



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core 12 lie inside waist-surrounding peripheral end portions 15 of the front and rear waist regions 13, 14 and transversely opposite side edges 12b of the core 12 lie inside the transversely opposite side portions 16 of the waist regions as well as thigh-surrounding peripheral end portions 17. In the 5 diaper 9, the waist-surrounding peripheral end portions 15, the side portions 16 and the thigh-surrounding peripheral end portions 17 are free from the presence of the core 12, so a region 21 of the diaper 9 except these portions 15, 16, 17 has thickness 10 larger than those of these portions 15, 16, 17. The individual diaper 9 is folded in two so that the front and rear waist regions 13, 14 may be placed upon each other as this diaper 9 is packed within the package 1A.

In the group G, first diapers 9a each having the 15 waist-surrounding peripheral end portions 15 facing to the first side wall 4 and second diapers 9b each having the waist-surrounding peripheral end portions 15 facing to the second side wall 5 are alternately stacked in the vertical direction. In the group G, the number of the first diapers 9a 20 is six and the number of the second diaper 9b is also six, that is, the number of the first and second diapers 9a, 9b are the same. From the top wall 2 toward the bottom wall 3 of the package 1A, the front waist region 13 of a second diaper 9b underlying

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a first diaper 9a is placed against the rear waist region 14 of this first diaper 9a and then the front waist region 13 of the next first diaper 9a underlying the next second diaper 9b is placed against the rear waist region 14 of this second diaper 9b, and so on.

In this packaged assembly, the first diapers 9a and the second diapers 9b are alternately stacked in the vertical direction and the number of the first diapers 9a is equal to the number of the second diapers 9b in the group G. Therefore, the thickness of the group G in the vertical direction has substantially no difference between its front half and rear half in spite of the fact that, both in the first diapers 9a and in the second diapers 9b, the thickness of the main body 21 is larger than the thickness of the waist-surrounding peripheral end portions 15. Even when the diapers 9 are packed within the package 1A to fill the maximum dimension of the package 1A in the vertical direction, no gap is formed between each pair of the adjacent diapers 9 both in the front half and in the rear half of the group G and thereby a packing efficiency for the diapers 9 within the package 1A can be improved.

In this packaged assembly, the first diapers 9a and the second diapers 9b in the group G are stacked in the vertical direction in sufficiently close contact one with another to

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prevent the waist-surrounding peripheral end portions 15 of the  
diapers 9 from being easily folded. Therefore, even when the  
groups G each stacked in vertical direction are packed within  
the package 1A not only between the first and second side walls  
5 4, 5 between the third and fourth side walls 6, 7, it is not  
apprehended that the group(s) G of the diapers 9 might collapse  
the waist-surrounding peripheral portions 15 of the diapers 9  
in the adjacent group(s) G and consequently form the  
waist-surrounding peripheral end portions 15 of the diapers 9  
10 with a plurality of irregular wrinkles.

Along the waist-surrounding peripheral end portions 15  
of the diaper 9, respective end portions 10a, 11a of the top-  
and backsheets 10, 11 extending outward beyond longitudinally  
opposite ends 12a of the core 12 are overlaid and joined together.  
15 The waist-surrounding peripheral end portions 15 of the diaper  
9 are provided with waist-surrounding elastic members 22  
secured thereto in a stretched state. These waist-surrounding  
elastic members 22 are interposed between the top- and  
backsheets 10, 11 and bonded to respective inner surfaces of  
20 the end portions 10a, 11a of these sheets 10, 11.

Along the transversely opposite side portions 16 of the  
waist regions and thigh-surrounding peripheral end portions 17,  
respective side edge portions 10b, 11b of the top- and

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backsheets 10, 11 extending outward beyond transversely opposite side edges 12b of the core 12 are overlaid and joined together. The thigh-surrounding peripheral end portions 17 of the diaper 9 are provided with thigh-surrounding elastic members 23 secured thereto in a stretched state. These thigh-surrounding elastic members 23 are interposed between the top- and backsheets 10, 11 and bonded to respective inner surfaces of the side edge portions 10b, 11b of these sheets 10, 11.

10 Fig. 4 is a side view of a package 1B illustrating one preferred embodiment of the packaged assembly and Fig. 5 is a side view of the package 1C illustrating another preferred embodiment of the packaged assembly. Figs. 4 and 5 show the packages 1B, 1C with the third side walls 6 thereof cutaway to  
15 expose the diapers 9 packed therein. In Figs. 4 and 5, a forward direction is indicated by an arrow Y1, a backward direction is indicated by an arrow Y2 and a vertical direction is indicated by an arrow Z.

Similarly to the package 1A shown in Fig. 1, each of  
20 packages 1B, 1C is formed of a flexible sheet in a rectangular hexahedron being relatively long in the vertical direction in which each pair of adjacent surfaces are substantially orthogonal to each other. The diaper 9 is the pants-type

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disposable diaper 9 similar to that shown in Fig. 1 and the main body 21 which is the region of the diaper 9 except for the waist-surrounding peripheral end portions 15, the transversely opposite side portions 16 of the waist regions and the thigh-surrounding peripheral end portions 17 has the thickness larger than those of these portions 15, 16, 17. The individual diapers 9 are folded so that the front and rear waist regions 13, 14 thereof may contact each other as these diapers 9 are packed within the package 1B, 1C.

10       The packaged assemblies shown in Figs. 4 and 5, respectively, are distinguished from the packaged assembly shown in Fig. 1 in arrangement as will be described. In the packaged assembly shown in Fig. 4, one group G consists of eleven diapers 9 stacked in the vertical direction of the package 1B.

15       In the packaged assembly shown in Fig. 5, one group G consists of twelve diapers 9 stacked in the vertical direction of the package 1C. Within these packages 1B, 1C, these diapers 13 are under compression in the vertical direction.

Referring to Fig. 4, the group G comprises five first  
20       diapers 9a and six second diapers 9b. In the group G, the first diapers 9a are stacked in the vertical direction from a vertically middle of the package 1B toward the top wall 2 of the package 1B and the second diapers 9 are stacked in the

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vertical direction from the bottom 3 of the package 1B toward the vertically middle of the package 1B.

The waist-surrounding peripheral end portions 15 of the first diaper 9a face to the first side wall 4. The  
5 waist-surrounding peripheral end portions 15 of the second diaper 9b facing to the second side wall 5. Concerning the first diapers 9a arranged from the vertically middle of the package 1B toward the top wall 2 of the package 1B, the front waist region 13 of the diaper 9a underlying the uppermost first diaper 9a  
10 is placed against the rear waist region 14 of this uppermost first diaper 9a and the front waist region 13 of the first diaper 9a underlying this precedent first diaper 9a is placed against the rear waist region 14 of this precedent first diaper 9a, and so on. Concerning the second diapers 9b stacked from the bottom  
15 wall 3 of the package 1B toward the vertically middle of the package 1B, the front waist region 13 of the diaper 9b underlying the uppermost second diaper 9b is placed against the rear waist region 14 of this uppermost second diaper 9b and the front waist region 13 of the second diaper 9b underlying this precedent  
20 second diaper 9b is placed against the rear waist region 14 of this precedent second diaper 9b, and so on.

In the packaged assembly shown in Fig. 4, the number of the second diapers 9b is larger than the number of the first

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diapers 9a by one in the group G. In spite of this difference in the number of the first and second diapers 9a, 9b, there is no anxiety that a gap might be formed between each pair of the adjacent diapers 9 both at the side of the first side wall 4 and at the side of the second side wall 5 of the group G because the thickness of the group G in the vertical direction in the vicinity of the first side wall 4 of the package 1B is substantially equal to that in the vicinity of the second side wall 5 of the package 1B. In this way, a packing efficiency for the diapers 9 within the package 1B is improved.

Referring to Fig. 5, each of the group G consists of six first diapers 9a and six second diapers 9b. In the group G, each pair of the first diapers 9a are stacked upon each other in the vertical direction and each pair of the second diapers 9b are stacked upon each other in the vertical direction. In this manner, the pair of the first diapers 9a and the pair of the second diapers 9b are alternately stacked in the vertical direction.

Concerning the first diaper 9a, a crotch region 24 is folded toward the outer surface of the backsheet 11 extending in the rear waist region 14 and the waist-surrounding peripheral end portions 15 face to the first side wall 4. Concerning the second diaper 9b, the crotch region 24 is folded toward the outer

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surface of the backsheet 11 extending in the rear waist region 14 and the waist-surrounding peripheral end portions 15 face to the second side wall 5. In each pair of the first diapers 9a, the front waist region 13 of the lower diaper 9a is placed  
5 against the rear waist region 14 of the upper diaper 9a. In each pair of the second diapers 9b, the rear waist region 14 of the lower diaper 9b is placed against the front waist region 13 of the upper diaper 9b. The front waist region 13 of the first diaper 9a and the front waist region 13 of the second diaper  
10 9b are placed upon each other.

In the packaged assembly shown in Fig. 5, the number of the first diapers 9a is equal to the number of the second diapers 9b and there is no difference in the thickness of the package 1C in the vertical direction between in the vicinity of the first  
15 side wall 4 and in the vicinity of the second side wall 5 of the package 1C. In this packaged assembly, no gap is formed between each pair of the adjacent diapers between the first and second side walls 4, 5 of the package 1C and a packing efficiency for the diapers 9 within the package 1C is effectively improved.

20 The packaged assembly shown in Fig. 5 may be modified so that a set of three or more first diapers 9a and a set of three or more second diapers 9b are alternately stacked one upon another in the vertical direction. In the packaged assembly



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shown in Fig. 5, it is not essential to fold the crotch regions 24 of the diapers 9.

For these packaged assemblies as have been described above, a difference in the number of the first diapers 9a and 5 the number of the second diapers 9b in one and same group G is preferably in a range of  $0 - \pm 3$ . In any one of these embodiments, three or more groups G may be arranged between the first and second side walls 4, 5 and/or three or more groups G may be arranged between the third and fourth side walls 6, 7 within 10 the package 1A, 1B, 1C. The diapers packed within the package 1A, 1B, 1C are not limited to the pants-type diaper but may be open-type diapers having transversely opposite side edge portions of the front and rear waist regions being connected as the diapers are worn. The number of the diapers 9 packed 15 within the package 1A, 1B, 1C is not specified and may be increased to thirteen or more or reduced to nine or less.

The package 1A, 1B, 1C may be formed using a breathable but liquid-impervious plastic film or a breathable but liquid-impervious fibrous nonwoven fabric. The topsheet 10 of 20 the diaper 9 may be formed using a hydrophilic fibrous nonwoven fabric, a hydrophobic fibrous nonwoven fabric having a plurality of fine pores or a plastic film having a plurality of fine pores. The backsheet 11 of the diaper 9 may be formed

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using a hydrophobic fibrous nonwoven fabric, a breathable but liquid-impervious plastic film, a composite nonwoven fabric consisting of layers of hydrophobic fibrous nonwoven fabrics laminated one with another or a composite sheet consisting of  
5 a hydrophobic fibrous nonwoven fabric and a breathable but liquid-impervious plastic film.

The plastic film used herein is preferably made of polyolefine-based thermoplastic synthetic resin such as polypropylene or polyethylene.

10 The fibrous nonwoven fabric used herein may be selected from a group including products obtained by spun lace process, needle punch process, melt blown process, thermal bond process, spun bond process, chemical bond process and air-through process. Component fiber of the nonwoven fabric may be selected  
15 from a group including polyolefine-, polyester-, polyamide-based fibers and core-sheath type or side-by-side type conjugated fibers of polyethylene/polypropylene or polyethylene/polyester.

The packaged assembly according to this invention has the  
20 advantageous effects that a plurality of diapers comprising the first diapers each having the waist-surrounding peripheral end portions facing to the first side wall 4 of the package and the second diapers each having the waist-surrounding peripheral end

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portions facing to the second side wall 5 of the package are packed within the package and each group of the diapers consists of the first and second diapers of approximately same number. Even if a plurality of the diapers each having different thickness between the waist-surrounding peripheral end portions and the main body are packed within the package so as to fill the maximum dimension of the package in its vertical direction, no gap will be formed between each pair of the adjacent diapers both at the side of the first side wall 4 and at the side of the second side wall 5 of the group. In this way, a packing efficiency for the diapers within the package is improved.

With this packaged assembly, the first and second diapers are stacked one upon another in sufficiently close contact one with another in the vertical direction to prevent the waist-surrounding peripheral end portions to be easily folded. Therefore, even when two or more groups are arranged between the first and second side walls 4, 5 as well as between the third and fourth side walls 6, 7 within the package, it is not apprehended that the one group(s) of the diapers might collapse the waist-surrounding peripheral portions of the diapers in the other group(s) and consequently form the waist-surrounding peripheral end portions of the diapers in the adjacent group(s)

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with a plurality of irregular wrinkles.

Even when the number of the first diapers is not equal to the number of the second diapers in one and same group, no gap will be formed between each pair of the stacking diapers both at the side of the first side wall 4 and at the side of the second side wall 5 of the group so far as the difference between these numbers is in a range of  $0 - \pm 3$ . In this way, a packing efficiency for the diapers within the package is improved.